Measuring Projector PJ-A3000 Series

Series 302

The PJ-A3000 Series profile projector is a medium-sized model that gives you excellent versatility and easy operation.
The PJ-A3000 offers you the following benefits:

- The easy-to-read digital XY counter is located near the projection screen to minimize eye movement.
- You can measure angles easily with the digital readout protractor screen.

302-701-1D

302-704-1D

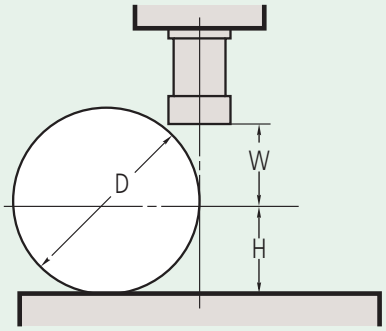
302-702-1D

302-703-1D

302-701-1D

Specifications

Projected image	Inverted
Projector screen	Effective diameter : 315 mm Screen material : Fine-ground glass Screen rotation : ±360°, fine feed and clamp Angle display : Digital counter (LED) Resolution : 1' or 0,01° (switchable) Range : ±370° ABS/INC mode switching, Zero Set Reference lines : Cross-hairs
Projection lens	10X **(990948)** Optional : 20X, 50X, 100X
Magnification accuracy	Contour illumination : ±0,1% or better Surface illumination : ±0,15% or better
Contour illumination	Light source : Halogen bulb (24V, 150W) Optical system : Telecentric Functions : 2-step (High/Low) brightness switch, Heat-absorbing filter, Cooling fan
Surface illumination	Light source : Halogen bulb (24V, 150W) Optical system : Vertical illumination with adjustable condenser lens Functions : Heat-absorbing filter, Cooling fan
Focusing	Manual
Resolution [µm]	0,001 mm (0,001 mm : digital head)
Power supply	220 - 240V AC, 50/60Hz



D : Max. workpiece diameter
W : Working distance
H : Max. workpiece height

mm

		Magnification			
		10X	20X	50X	100X
View field		ø31.5	ø15.7	ø6.3	ø3.1
W		66 (20)	32.5 (2)	12.6	5
H	-50 models*	123.5	123.5	123.5	123.5
	-100 models	91	91	91	91
	-150 models	103.5	103.5	103.5	103.5
	200 models	92.5	92.5	92.5	92.5
D	-50 models*	224 (198)	87 (61)	27	10
	-100 models	182	87 (61)	27	10
	-150 models	207 (198)	87 (61)	27	10
	200 models	185	87 (61)	27	10

( ) When using surface illumination

Refer to the PJ-A3000 brochure

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Measuring Projector PJ-A3000 Series

Series 302 - Metric model

Standard accessories

No.	Description
172-202	Projection lens 10X
383876	Protective hood
512305	Halogen bulb (24V, 150W)

Optional accessories

No.	Description	Price €
172-116	Standard scale 50 mm	170,00
172-160-3	Green filter	148,00
172-161	Reading scale 300 mm	340,00
172-197	Swivel centre support	824,00
172-203	Projection lens 20X	775,00
172-204	Projection lens 50X	1014,00
172-207	Projection lens 100X	1014,00
172-229	Oblique illumination mirror 10X Projection lens	101,00
172-230	Oblique illumination mirror 20X Projection lens	80,00
172-378	V-block with clamp (Max. workpiece ø25 mm)	313,00
176-107	Holder with clamp	266,00
172-118	Reading scale 200 mm	281,00
172-160-2	Green filter	85,00
176-105	Swivel centre support	950,00
999678D	Fixture mount adapter	469,00
512305	Halogen bulb (24V, 150W)	13,00
12AAE671	Detector mounting plate for ø250 to ø350 mm	40,00
332-151	Optoeye-200	1473,00
176-106	Rotary table 66 mm	796,00
172-196	Rotary table 100 mm	955,00
172-198	Rotary table 100 mm with fine adjustment	976,00
264-155D	QM-Data 200 Stand type	
264-156D	QM-Data 200 Arm mount type	

176-106 : for stage 150 x 50 mm
172-196 and 172-198 : for stage 100 x 100 and 200 x 100 mm

	METRIC - (INCH/METRIC)	
	302-700D - (302-714E) 302-704D - (302-718E) 302-708D - (302-719E) 302-709D	302-701D - (302-711E) 302-702D - (302-712E) 302-703D - (302-713E) 302-705D 302-706D 302-707D
176-106	X	—
172-196	—	X*
172-198	—	X*
176-105	X	X*
172-197	—	X*
176-107	X	X*
172-378	X	X*

*** Fixture mount adapter (999678) is required for 302-701-1D**

172-378

176-107

172-116

172-118

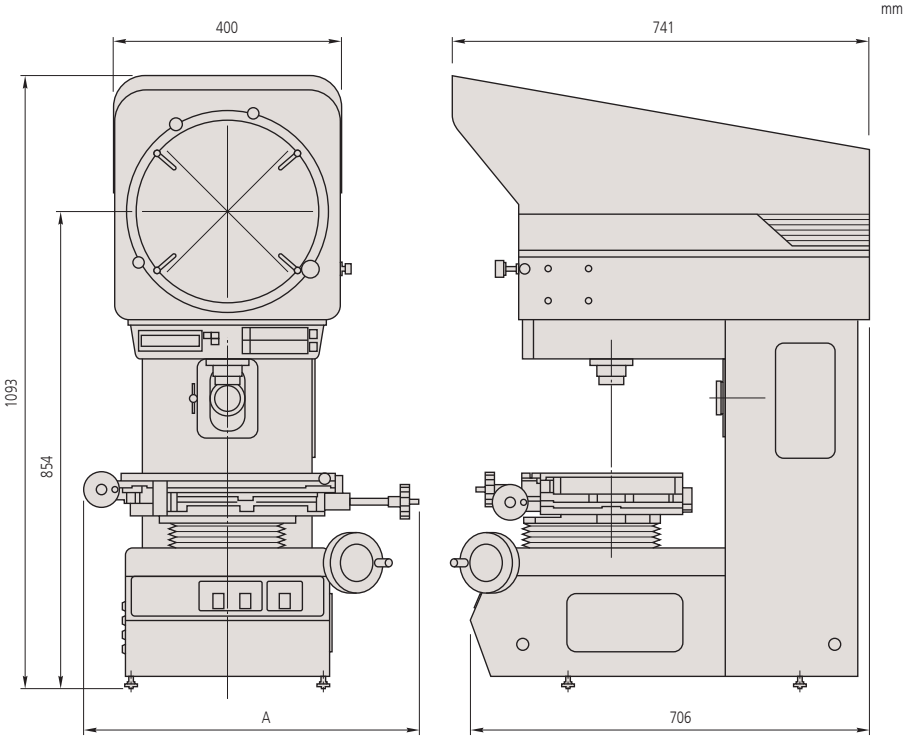
172-229

172-160-3

Metric

XY stage 50 x 50 or 150 x 50 or 100 x100 or 200 x 100 mm

Model	PJ-A3005D-50	PJ-A3005F-150	PJ-A3010F-100	PJ-A3010F-200
No.	**302-704-1D**	**302-702-1D**	**302-703-1D**	**302-701-1D**
Price [€]	**9756,00**	**11330,00**	**10887,00**	**12875,00**
XY stage [mm]	50 x 50	150 x 50	100 x 100	200 x 100
Measuring method	Digimatic micrometer head	Linear encoder	Linear encoder	Linear encoder
Quick-release mechanism	_	X and Y axes	X and Y axes	X and Y axes
XY stage table top size [mm]	152 x 152	280 x 152	250 x 250	380 x 250
XY stage effective area [mm]	82 x 82	185 x 84	142 x 142	266 x 170
Stage glass No.	**380405**	**381349**	**12BAE041**	**382762**
Swiveling function	_	_	_	±3°
Max stage loading [kg]	10	8	10	8
Mass kg	107	116	112	140



A = 593 mm : 302-701-1D, A = 446 mm : 302-702-1D
A = 427 mm : 302-703-1D

264-155D, QM-Data 200

OPTOEYE-200

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Measuring Projector PJ-H30 Series

Series 303

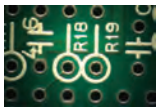
This measuring projector has adjustable incident illumination.
The PJ-H30 offers you the following benefits:

- By rotating the condenser lens and changing the angle of the mirror in the objective, you can represent even poorly reflecting surfaces optimally.
- Improved light intensity of a projected subject thanks to the new optical contour illumination system.
- High measuring accuracy (above JIS standard).
- Measuring stage with rapid single-handed adjustment on both axes enabling you to switch smoothly between quick positioning and fine adjustment.
- Constant current power supply unit with acceleration control to maximize the service life of the halogen lamp.
- Easily read digital counter with large digit display.
- The PJ-H30D models also offer you a built-in precision edge detector (Optoeye).
- RS-232C output.

303-735-1D

Vertical / oblique switchable surface illumination

Vertical illumination



Oblique illumination

1010B

2010B

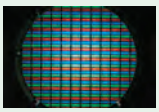
2017B

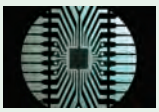
Specifications

Accuracy	(3+0,02L) µm L : Max length measurement
Projected image	Erect
Projector screen	Effective diameter : 306 mm Screen material : Fine-ground glass Screen rotation : ±360°, fine adjustment and clamp Angle display : Digital counter (LED) Resolution : 1' or 0,01° (switchable) Range : ±370° ABS/INC mode switching, Zero Set Reference lines : Cross-hairs
Projection lens	10X **(172-472)** Optional : 5X, 20X, 50X, 100X
Magnification accuracy	Contour illumination : ±0,1% or better Surface illumination : ±0,15% or better
Contour illumination	Light source : Halogen bulb (24V, 150W) Optical system : Telecentric zoom Functions : Continuously variable brightness adjustment, Heat-absorbing filter, Cooling fan
Surface illumination	Light source : Halogen bulb (24V, 150W) Optical system : Vertical/Oblique illumination with an adjustable condenser lens Functions : Continuously variable brightness adjustment, Heat-absorbing filter, Cooling fan
Power supply	220V AC, 50/60Hz
Resolution [µm]	0,001 mm

Unit: mm

	Magnification				
	5X	10X	20X	50X	100X
View field	ø61.2	ø30.6	ø15.3	ø6.12	ø3.06
H	105	105	105	105	105
W	66	70.5	56.5	50	50
D	148	197	137	114	114





Profile Projector brochure on request

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Measuring Projector PJ-H30 Series

Series 303

Model 1010B - 100 x 100 mm
XY stage table size : 300 x 240 mm
XY stage effective area : 180 x 150 mm
Stage glass No. : **380412**
Swiveling function : ±3°
Max stage loading : 10 kg
Mass : 176 kg

Model	PJ-H30A	PJ-H30D
No.	**303-712-1D**	**303-732-1D**
Price [€]	**17980,00**	**22215,00**
Focusing	Manual	Power focus
Edge detector	Optional	Built-In

Model 2010B - 200 x 100 mm
XY stage table size : 350 x 280 mm
XY stage effective area : 250 x 150 mm
Stage glass No. : **382762**
Swiveling function : ±3°
Max stage loading : 10 kg
Mass : 178 kg

Model	PJ-H30A	PJ-H30D
No.	**303-713-1D**	**303-733-1D**
Price [€]	**20600,00**	**23793,00**
Focusing	Manual	Power focus
Edge detector	Optional	Built-In

Model 2017B - 200 x 170 mm
XY stage table size : 410 x 342 mm
XY stage effective area : 270 x 240 mm
Stage glass No. : **12BAD363**
Swiveling function : ±5°
Max stage loading : 20 kg
Mass : 205 kg

Model	PJ-H30A	PJ-H30D
No.	**303-714-1D**	**303-734-1D**
Price [€]	**22250,00**	**25441,00**
Focusing	Manual	Power focus
Edge detector	Optional	Built-In

Model 3017B - 300 x 170 mm
XY stage table size : 510 x 342 mm
XY stage effective area : 370 x 240 mm
Stage glass No. : **12BAD330**
Swiveling function : ±5°
Max stage loading : 20 kg
Mass : 212 kg

Model	PJ-H30A	PJ-H30D
No.	**303-715-1D**	**303-735-1D**
Price [€]	**25750,00**	**28943,00**
Focusing	Manual	Power focus
Edge detector	Optional	Built-In

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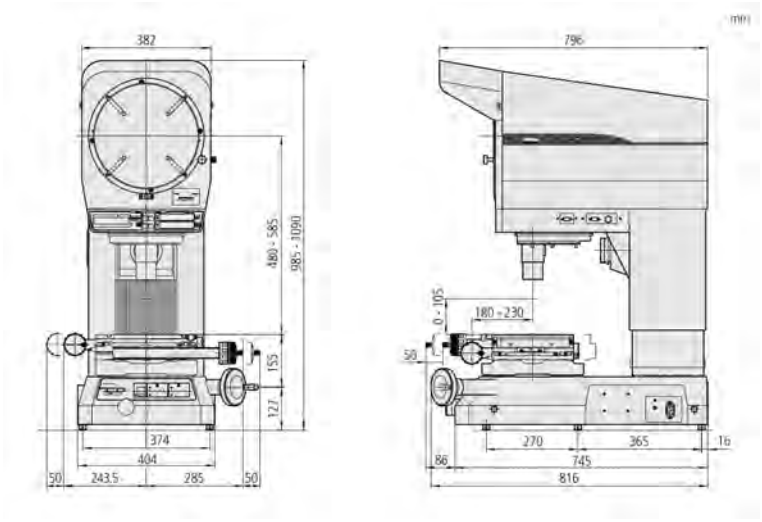
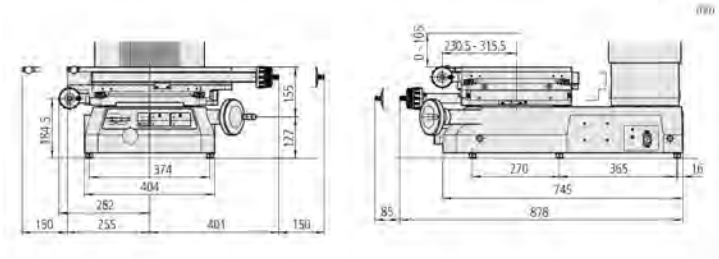
Measuring Projector PJ-H30 Series

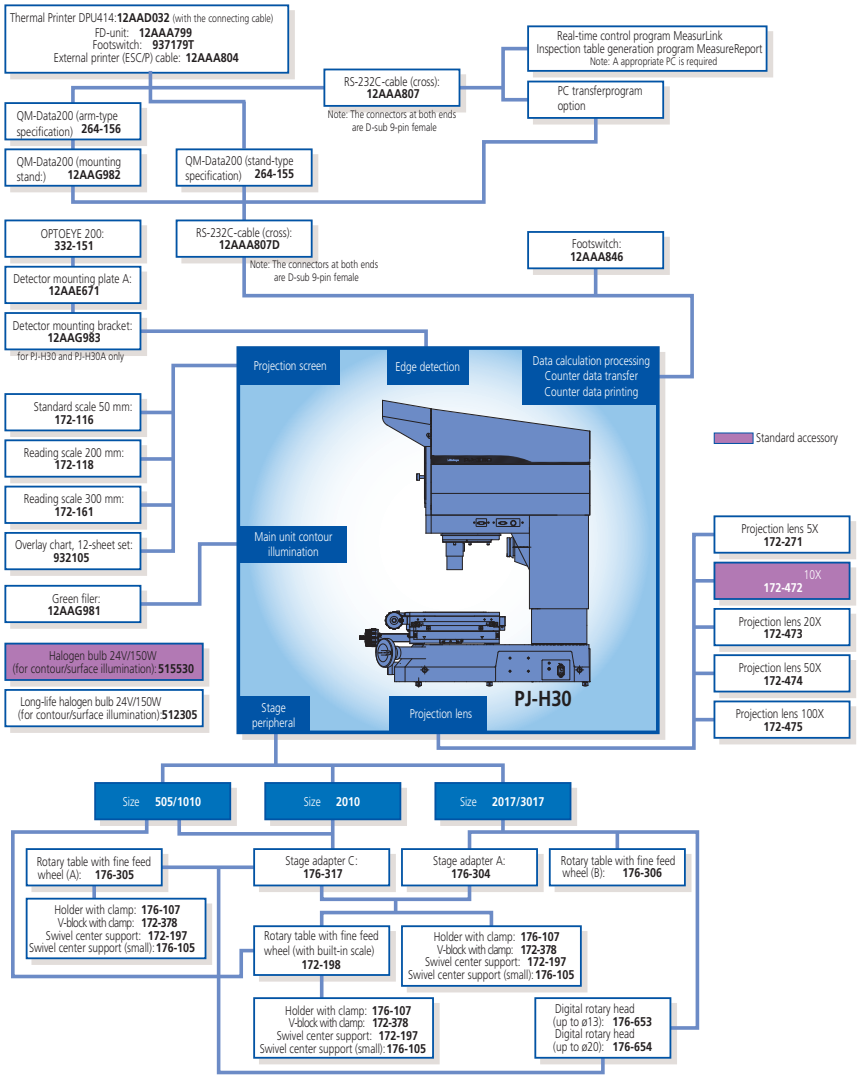
Series 303



1010B model



3017B model


Thermal Printer DPU414: 12AAD032 (with the connecting cable)
FD-unit: 12AAA799
Footswitch: 937179T
External printer (ESC/P) cable: 12AAA804
RS-232C-cable (cross): 12AAA807
Note: The connectors at both ends are D-sub 9-pin female
Real-time control program MeasurLink
Inspection table generation program MeasureReport
Note: A appropriate PC is required
PC transferprogram option
QM-Data200 (arm-type specification) 264-156
QM-Data200 (mounting stand:) 12AAG982
QM-Data200 (stand-type specification) 264-155
OPTOEYE 200: 332-151
Detector mounting plate A: 12AAE671
Detector mounting bracket: 12AAG983
for PJ-H30 and PJ-H30A only
RS-232C-cable (cross): 12AAA807D
Note: The connectors at both ends are D-sub 9-pin female
Footswitch: 12AAA846
Projection screen
Edge detection
Data calculation processing
Counter data transfer
Counter data printing
Standard scale 50 mm: 172-116
Reading scale 200 mm: 172-118
Reading scale 300 mm: 172-161
Overlay chart, 12-sheet set: 932105
Green filer: 12AAG981
Main unit contour illumination
Halogen bulb 24V/150W (for contour/surface illumination): 515530
Long-life halogen bulb 24V/150W (for contour/surface illumination): 512305
Stage peripheral
Projection lens
PJ-H30
Standard accessory
Projection lens 5X 172-271
10X 172-472
Projection lens 20X 172-473
Projection lens 50X 172-474
Projection lens 100X 172-475
Size 505/1010
Size 2010
Size 2017/3017
Rotary table with fine feed wheel (A): 176-305
Stage adapter C: 176-317
Stage adapter A: 176-304
Rotary table with fine feed wheel (B): 176-306
Holder with clamp: 176-107
V-block with clamp: 172-378
Swivel center support: 172-197
Swivel center support (small): 176-105
Rotary table with fine feed wheel (with built-in scale) 172-198
Holder with clamp: 176-107
V-block with clamp: 172-378
Swivel center support: 172-197
Swivel center support (small): 176-105
Holder with clamp: 176-107
V-block with clamp: 172-378
Swivel center support: 172-197
Swivel center support (small): 176-105
Digital rotary head (up to ø13): 176-653
Digital rotary head (up to ø20): 176-654

Standard accessories

No.	Description
172-472	Lens 10X
383876	Protective hood
512305	Halogen bulb (24V, 150W)

Optional accessories

No.	Description	Price €
332-151	Optoeye-200	1473,00
12AAE671	Detector mounting plate for ø250 to ø350 mm	40,00
12AAG983	Detector mounting bracket for PJ-H30A/PJ-H30E	43,00
12AAG981	Green filter	290,00
172-116	Standard scale 50 mm	170,00
172-118	Reading scale 200 mm	281,00
172-161	Reading scale 300 mm	340,00
172-271	Projection lens 5X	1804,00
172-473	Projection lens 20X	1389,00
172-474	Projection lens 50X	1433,00
172-475	Projection lens 100X	1443,00
176-105	Swivel centre support	950,00
172-197	Swivel centre support	824,00
172-198	Rotary table 100 mm with fine adjustment	976,00
172-378	V-block with clamp (Max. workpiece ø25 mm)	313,00
176-305	Rotary table with fine feed wheel ø183 mm	1857,00
176-306	Rotary table with fine feed wheel ø240 mm	2408,00
011534	Cleaner for optics	19,00
12AAA807D	RS-232C cable (2m)	56,00
12AAG982	Mounting stand for QM-Data 200	737,00
264-155D	QM-Data 200 Stand type	
264-156D	QM-Data 200 Arm mount type	

264-155D
QM-Data 200

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Measuring Projector PV-5110

Series 304

- This measuring projector is a robust stand-alone device.
- The large rotatable screen guarantees you good observation and easy measuring.

Specifications

Projected image	Inverted
Projector screen	Effective diameter : 508 mm Screen material : Fine-ground glass Screen rotation : ±360°, fine adjustment and clamp Angle reading : Digital counter (LED) Resolution : 1' or 0,01° (switchable) Range : ±370° ABS/INC mode switching, Zero Set Reference lines : Cross-hairs
Projection lens	10X **(172-402)** Optional : 5X, 20X, 50X, 100X
Magnification accuracy	Contour illumination : ±0,1% or better Surface illumination : ±0,15% or better
Contour illumination	Light source : Halogen bulb (24V, 150W) Optical system : Telecentric zoom Functions : 2-step (High/Low) brightness switch, Heat-absorbing filter, Cooling fan
Surface illumination	Light source : Halogen bulb (24V, 150W) Optical system : Vertical illumination Functions : Adjustable condenser lens, Oblique illumination (for 5X, 10X and 20X), Heat-absorbing filter, Cooling fan
Focusing	Manual
Resolution [µm]	0,001 mm
Power supply	220 - 240V AC, 50/60Hz
Mass	210 kg

mm

	Magnification				
	5X	10X	20X	50X	100X
View field	ø101.6	ø50.8	ø25.4	ø10.16	ø5.08
H	125	181	206	87	87
W	60 (27)	60	60	32.4	22.5
D	120	120	120	64.8	45

( ) When using surface illumination

Profile Projector brochure on request

304-919D
Counter is optional

KA Counter

QM-Data 200

OPTOEYE 200

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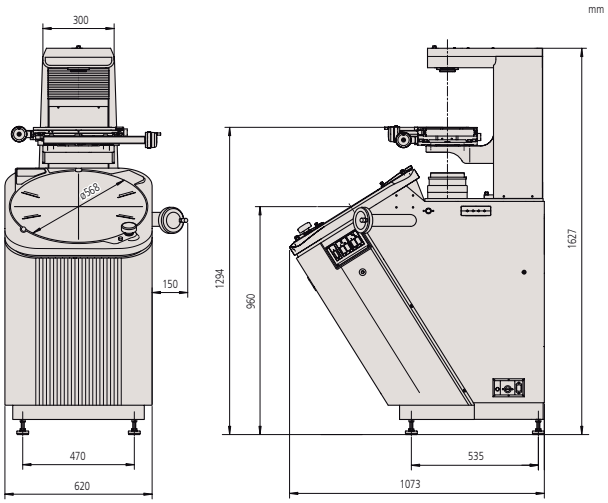
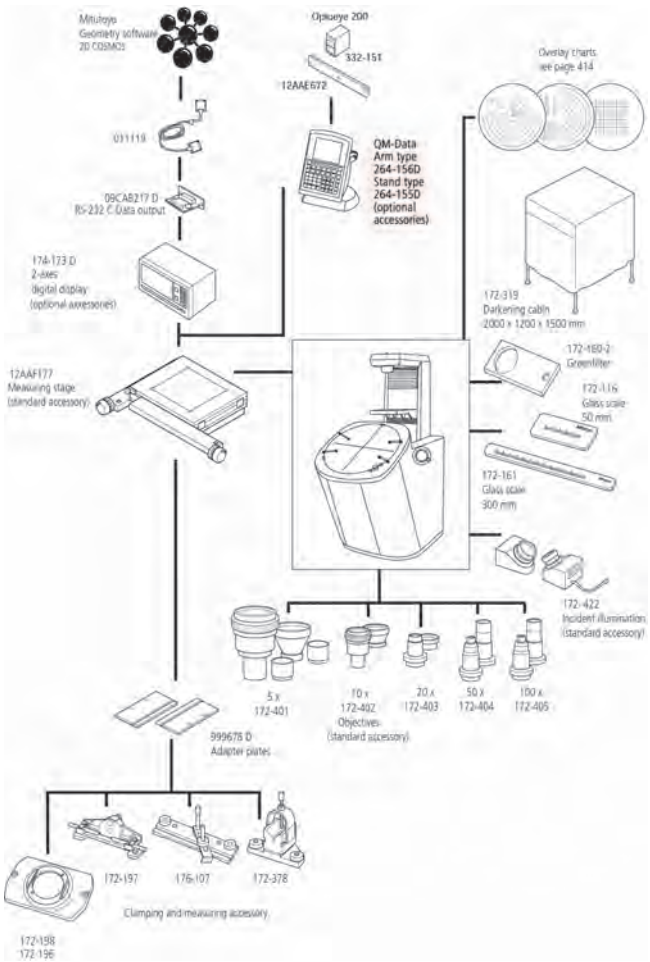
Mitutoyo

Measuring Projector PV-5110

Series 304 - Accessories/Dimensions

Model	PV-5110
No.	**304-919D**
Price [€]	**15450,00**
XY stage [mm]	200 x 100
Measuring method	Linear encoder
Quick-release mechanism	X and Y axes
XY stage table top size [mm]	380 x 250
XY stage effective area [mm]	266 x 170
Stage glass No.	**382762**
Swiveling function	±3°
Max stage loading [kg]	5





Standard accessories

No.	Description
172-402	10X projection lens set including : 172-409 Objective 172-410 Condenser
512305	Halogen bulb (24V, 150W)
12AAF182	Digital counter stand
382762	Stage glass 280x180
172-422	Surface illumination unit

Optional accessories

No.	Description	Price €
172-401	5X projection lens set including : 172-406 Objective 172-407 Condenser 932602 Adapter for objective	5729,00
172-403	20X projection lens set including : 172-411 Objective 172-412 Condenser	1671,00
172-404	50X projection lens set including : 172-413 Objective 172-414 Condenser	1719,00
172-405	100X projection lens set including : 172-415 Objective 172-414 Condenser	1835,00
172-116	Standard scale 50 mm	170,00
172-330	Standard scale 80 mm	234,00
172-161	Reading scale 300 mm	340,00
172-329	Reading scale 600 mm	695,00
172-160-2	Green filter	85,00
172-319	Canopy	1056,00
510189	Protective hood	93,00
172-198	Rotary table 100 mm with fine adjustment	976,00
172-197	Swivel centre support	824,00
176-107	Holder with clamp	266,00
172-378	V-block with clamp (Max. workpiece ø25 mm)	313,00
011534	Cleaner for optics	19,00
174-173D	KA-Counter 2 Axis	530,00
12AAE672	Optoeye mounting plate for ø500 to ø600 mm screen	56,00
264-156D	QM-Data 200 Arm mount type	

172-319

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Measuring Projector PH-A14

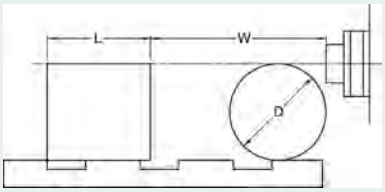
Series 172

Measuring Projector PH-A14

- Due to the PH-A14's horizontal-beam illumination, you can easily measure larger and heavier workpieces including toothed racks and punching tools.
- You can use the projector for a wide range of applications due to its generous 203 x 102 mm stage travel and 45 kg allowable stage loading.

Specifications

Projected image	Inverted
Projector screen	Effective diameter : 356 mm Screen material : Fine-ground glass Screen rotation : ±360°, fine adjustment and clamp Angle reading : Vernier, graduation : 1' Resolution : 1' or 0,01° (switchable) Range : ±370° Reference lines : Cross-hairs
Projection lens	10X **(172-011)** Optional : 20X, 50X, 100X
Magnification accuracy	Contour illumination : ±0,1% or better Surface illumination : ±0,15% or better
Contour illumination	Light source : Halogen bulb (24V, 150W) Optical system : Telecentric Functions : Heat-absorbing filter, Cooling fan
Surface illumination	Light source : Halogen bulb (24V, 150W) Optical system : Vertical illumination Functions : Adjustable condenser lens, Heat-absorbing filter, Cooling fan
Focusing	Manual
Resolution [µm]	0,001 mm (using optional KA counter)
Power supply	220 - 240V AC, 50/60Hz
Mass	140 kg



L : Max. workpiece width
W : Working distance
D : Max. workpiece diameter

PH-A14 mm

	Magnification			
	10X	20X	50X	100X
View field	35.6	17.3	7.12	3.56
L	235	235	80	109
W	93	40	14.6	9.5
D	130	116	30.4	19

172-810-20D
With optional evaluation unit QM-Data 200

KA Counter

QM-Data 200

OPTOEYE 200

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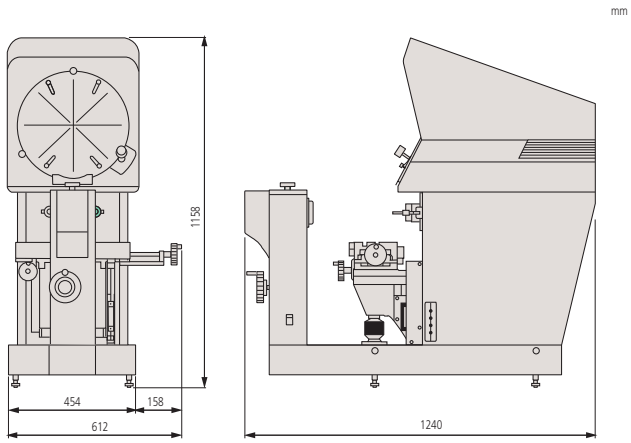
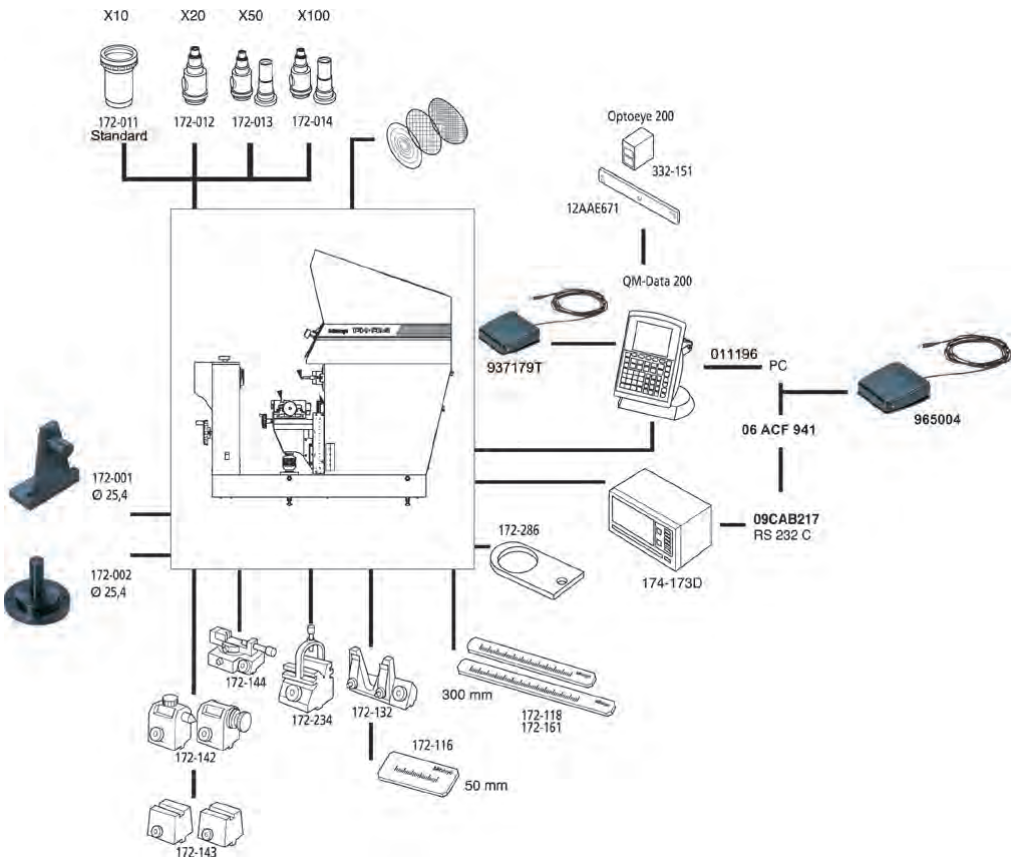
Mitutoyo

Measuring Projector PH-A14

Series 172 - Accessories/Dimensions



Model	PH-A14
No.	**172-810-20D**
Price [€]	**8168,00**
XY stage [mm]	203 x 102
Measuring method	Linear encoder
XY stage table top size [mm]	407 x 153
Max stage loading [kg]	45



Standard accessories

No.	Description
172-011	Lens 10X for Profile Projector PH-A14
512305	Halogen bulb (24V, 150W)

Optional accessories

No.	Description	Price €
174-173D	KA-Counter 2 Axis	530,00
172-013	Lens 50X for Profile Projector PH-A14	1083,00
172-012	Lens 20X for Profile Projector PH-A14	560,00
172-014	Lens 100X for Profile Projector PH-A14	1719,00
172-116	Standard scale 50 mm	170,00
172-118	Reading scale 200 mm	281,00
172-286	Green filter	222,00
172-143	Centre support riser	509,00
172-144	Rotary vice (Max. workpiece ø60 mm)	923,00
172-234	V-block with clamp (Max. workpiece ø50 mm)	568,00
172-132	Vertical holder	382,00
172-161	Reading scale 300 mm	340,00
172-001	Support for straight gear	838,00
172-002	Support for flat gear	1008,00
172-142	Centre support	976,00
011534	Cleaner for optics	19,00
332-151	Optoeye-200	1473,00
12AAE671	Detector mounting plate for ø250 to ø350 mm	40,00
264-156D	QM-Data 200 Arm mount type	
12AAF182	Digital counter stand	91,00

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Measuring Projector PH-3515F

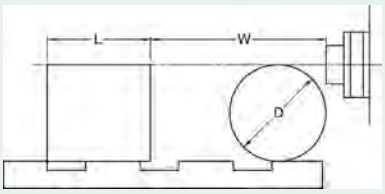
Series 172

Measuring Projector PH-3515F

- Due to the PH-3515F's horizontal-beam illumination, you can easily measure larger and heavier workpieces including toothed racks and punching tools. You can use the projector for a wide range of applications due to its generous 254 x 152 mm stage travel and 45 kg allowable stage loading.

Specifications

Projected image	Inverted
Projector screen	Effective diameter : 353 mm Screen material : Fine-ground glass Screen rotation : ±360°, fine feed and clamp Angle display : Digital counter (LED) Resolution : 1' or 0,01° (switchable) Range : ±370° ABS/INC mode switching, Zero Set Reference lines : Cross-hairs
Projection lens	10X **(172-184)** Optional : 5X, 20X, 50X, 100X
Magnification accuracy	Contour illumination : ±0,1% or better Surface illumination : ±0,15% or better
Contour illumination	Light source : Halogen bulb (24V, 150W) Optical system : Telecentric system Functions : 2-step (High/Low) brightness adjustment, Heat-absorbing filter, Cooling fan
Surface illumination	Light source : Halogen bulb (24V, 150W) Optical system : Vertical illumination Functions : Adjustable condenser lens, 2-step (High/Low) brightness adjustment, Heat-absorbing filter, Cooling fan
Focusing	Manual
Resolution	0,001 mm
Power supply	220 - 240V AC, 50/60Hz
Mass	150 kg



L : Max. workpiece width
W : Working distance
D : Max. workpiece diameter

PH-3515F mm

	Magnification				
	5X	10X	20X	50X	100X
View field	70.6	35.3	17.65	7.06	3.5
L	175	235	235	80	109
W	160 (64)	93 (35)	40	14.6	9.5
D	152.4	152.4	116	30.4	19

( ) When using surface illumination

172-868D

Model	PH-3515F
No.	**172-868D**
Price [€]	**14317,00**
XY stage [mm]	254 x 152
Measuring method	Linear encoder
Quick-release mechanism	X axis
XY stage table top size [mm]	450 x 146
Swiveling function	±10°
Max stage loading [kg]	45

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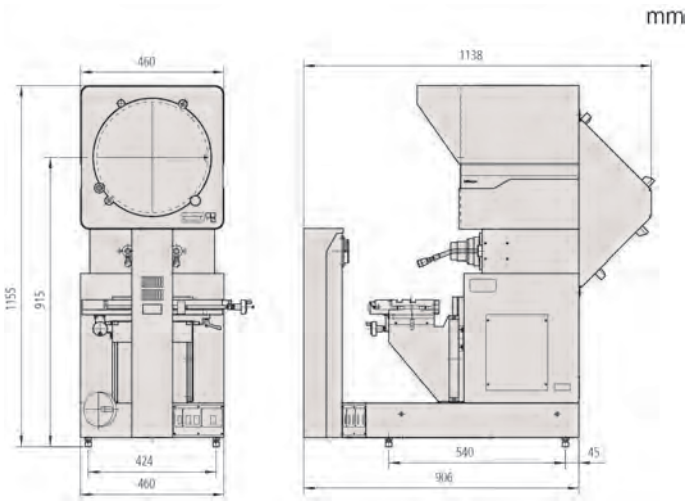
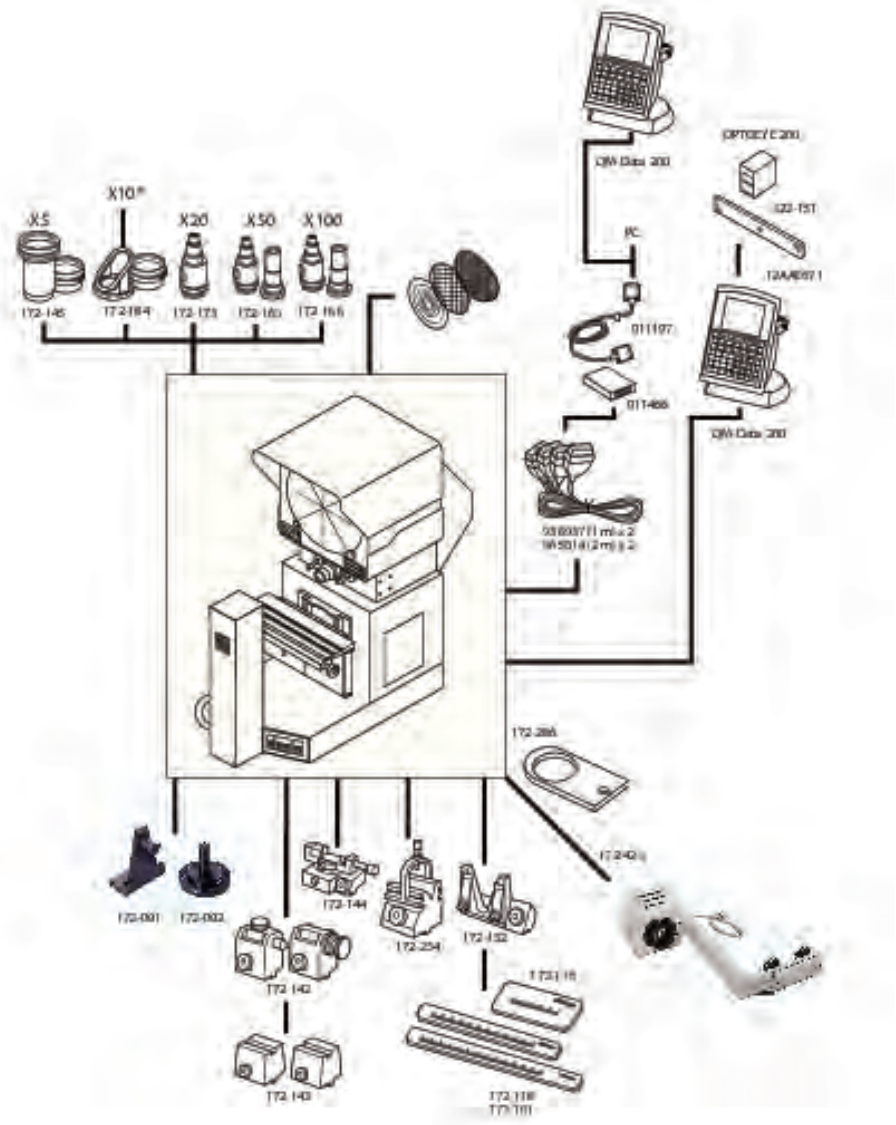
Mitutoyo

Measuring Projector PH-3515F

Series 172 - Accessories/Dimensions





Standard accessories

No.	Description
383228	Protective hood
172-184	Projection lens 10X
512305	Halogen bulb (24V, 150W)
12BAA637	Halogen bulb (24V, 200W)

Optional accessories

No.	Description	Price €
172-145	Projection lens 5X with condenser	2600,00
172-173	Projection lens 20X with condenser	652,00
172-165	Projection lens 50X with condenser	997,00
172-166	Projection lens 100X with condenser	1963,00
172-423	Vertical surface illumination unit	752,00
172-116	Standard scale 50 mm	170,00
172-118	Reading scale 200 mm	281,00
172-161	Reading scale 300 mm	340,00
172-286	Green filter	222,00
172-142	Centre support	976,00
172-143	Centre support riser	509,00
172-144	Rotary vice (Max. workpiece ø60 mm)	923,00
172-234	V-block with clamp (Max. workpiece ø50 mm)	568,00
172-132	Vertical holder	382,00
12AAM027	Overlay chart set (12 sheets) **(No. 12AAM587 to 12AAM598)**	855,00
12AAF182	Digital counter stand	91,00
011534	Cleaner for optics	19,00
174-173D	KA-Counter 2 Axis	530,00
332-151	Optoeye-200	1473,00
12AAE671	Detector mounting plate for ø250 to ø350 mm	40,00
264-156D	QM-Data 200 Arm mount type	

KA Counter

QM-Data 200

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Data Processing Unit QM-Data 200

Series 264

The Data Processing Unit QM 200 has been especially designed to process measurement data generated by a profile projector or measuring microscope.
The QM-Data 200 offers you the following benefits:

- Measuring instructions, measuring values and calculation results for various operations are shown on the back-lit LCD in a clear, easy to understand style.
- You can also print measuring results, either on a small and convenient thermal printer (available as a special option) or on an ESC/P printer and continuous paper.
- By connecting an optional floppy disk drive newly created part programs, you can store and/or load measurement results as well as calculation results.

Specifications

Resolution [µm]	1 / 0,1
Dimensions [mm]	260 x 242 x 310 : Stand-mount type 318 x 153 x 275 : Arm-mount type
Screen	Colour graphic TFT LCD (320 x 240 dots, with background lighting)
Program functions	Part program creation, execution, editing
Power supply	100/240V AC, 50/60 Hz
Statisical processing	Number of data, maximum value, minimum value, mean value, standard deviation, range, histogram
Measuring of Geometric Elements	Maximum of 1000 elements, point, line, circle, distance, ellipse, rectangular hole, slotted hole, intersection and intersecting angle and point & angle, plus a number of functions for evaluation, e.g. perpendicularity and parallelism are provided.
Measurement result file output	CSV format; MUX-10F format
Data output	USB, RS-232C, Printer
Display language	Japanese/English/German/French/ Italian/Spanish/Portuguese/Chech/ Traditional Chinese/Simplified Chinese/Korean/Turkish/Swedish/ Polish/Dutch/Hungarian
Functions	**Mitutoyo's AI Function :** The AI function (AI=Artificial Intelligence) renders choosing the element type before measuring obsolete. Point measurements are analysed by the QM-Data and the results for basic elements calculated, thus accelerating the measuring procedure. **Customized Operation :** Macro functions and the creation of part programs speed up single and repetition measurements. Additionally macro commands and part programs as well as frequently used standard operations can be stored as user menus.
Data input	USB, RS-232C, X/Y/Z-axis signal, Footswitch

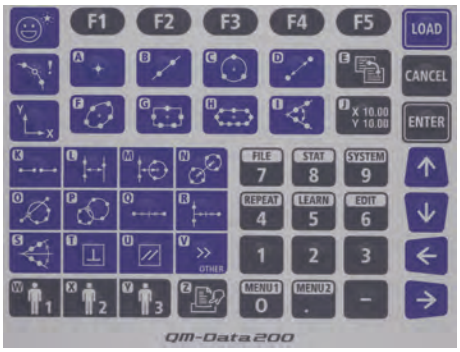
Optional accessories

No.	Description	Price €
12AAD033	Thermal printer (with connection cable)	752,00
908353-1	Printer paper for thermal printer	11,00
I-1525612	Cable for printer (2 m)	52,00
937179T	Footswitch	42,00
12AAA807D	RS-232C cable (2m)	56,00
011119	Signal cable RS-232C D-SUB 25 to D-SUB 9 (2m)	85,00

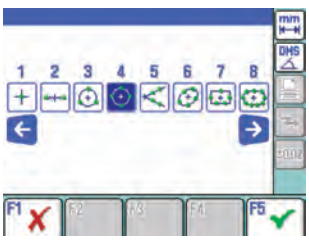
Stand-mount type

Arm-mount type

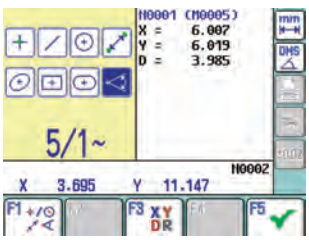
No.	Mass [kg]	Description
264-155D	2,9	Stand-mount type
264-156D	2,8	Arm-mount type
264-159D	2,9	Stand-mount type for Hyper MF / MF-U



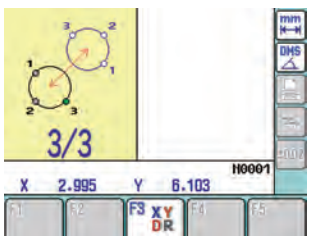
Intuitive panel design



Clear function icons



Coloured LCD display with backlight



Guided measurements

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Edge Detection Sensor OPTOEYE 200

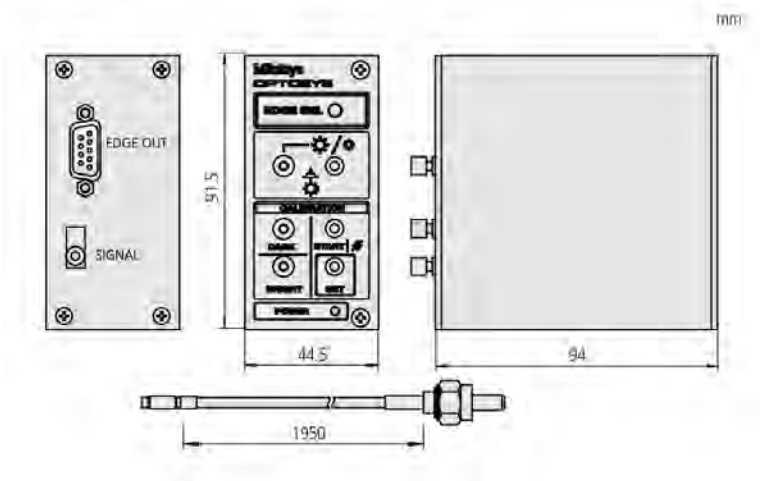
Series 332

This edge sensor allows you to make accurate measurements whatever your skill level by automatically detecting edges used in measurement.
The Optoeye 200 offers you the following benefits:

- Optoeye 200 reduces the effect of operator skill level on accuracy by automatically detecting edges used in measurement.
- PJ-H30: You can use the Optoeye edge detector on models PJ-H30A (requires adapter plate 12AAG983). The PJ-H30D models have a built-in edge detector.
- PV-5110, PJ-3515F and PJ-A14: You can use the Optoeye edge detector in conjunction with the QM-Data 200.
- PJ-A3000: You can use the Optoeye edge detector on models 302-701/302-702/302-703 in conjunction with the QM-Data 200.
- When you are using the Optoeye all projector scales must be connected to QM-Data 200 directly and built-in counters can no longer be used (except PJ-H30D type).

332-151

No.	Description	Price [€]
332-151	Edge detection sensor OPTOEYE 200	**1473,00**



Specifications

Image detection	Directivity : All directions
Min. diameter	2 mm on the screen
Min. width	1 mm on the screen
Applicable illumination	Type : Surface/Contour illumination Range : 30 to 2000 Lux on the screen Bright-Dark field difference : 20 Lux
Function	Automatic detection of feature edges for use in measurement

Optional accessories

No.	Description	Price €
12AAE671	Detector mounting plate for ø250 to ø350 mm	40,00
12AAE672	Optoeye mounting plate for ø500 to ø600 mm screen	56,00

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Accessories for Measuring Projectors

Additional Specifications

Grid divisions	10X : 0,1 mm 20X : 0,05 mm 50X : 0,02 mm 100X : 0,01 mm

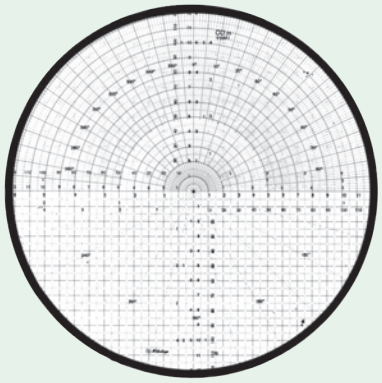
Group 1

For measuring projectors

These standard overlay charts increase the range of application and the efficiency of Mitutoyo profile projectors.

This chart set offers you the following benefits:

- The charts are supplied in sizes ø250, 300, 340, 500 and 600 mm to suit the screens of Mitutoyo projectors.
- A large range of scales and profiles is provided that enables you to test workpiece features quickly and easily. You can test length, height, parallelism, angle, radius, taper, bore position, diameter, as well as all standardized thread and tooth profiles.
- All charts are made of a distortion-free special plastics compound and are provided with a protective coating.



Combination chart

Combination chart

Angle : Divisions at 10° and 30' intervals at **178mm**/7" diameter increasing to **381mm**/15" intervals at **279mm**/11" diameter.

Features : All purpose chart for checking diameters, angles, radii and linear divisions

No.	Diameter [mm]	Price [€]
512651	250	**430,00**
512652	300	**499,00**
512653	340	**594,00**
512654	500	**933,00**
512655	600	**1221,00**

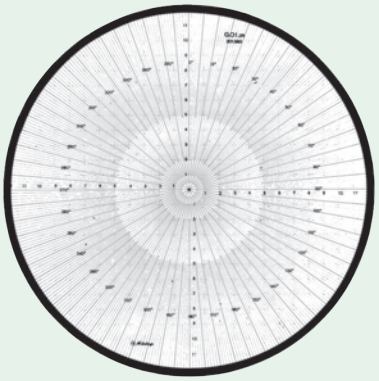
Grid/protractor chart

Grid/protractor chart

Angle : 15° increments

Features : Ideal for checking diameters, concentricity of diameters, radii, angles and cams.

No.	Diameter [mm]	Price [€]
201380	250	**430,00**
201386	300	**499,00**
201392	340	**594,00**
512621	500	**933,00**
511843	600	**1167,00**



Radius/protractor chart

Radius/protractor chart

Angle : Divisions at 1° and 30' intervals at **178mm**/7" diameter increasing to **381mm**/15" intervals at **279mm**/11" diameter.

Features : Ideal for checking diameters, concentricity of diameters, radii, angles, radii and cams

No.	Diameter [mm]	Price [€]
201383	250	**430,00**
201389	300	**499,00**
201395	340	**594,00**
512624	500	**933,00**
511846	600	**1167,00**

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Accessories for Measuring Projectors

Group 1

For measuring projectors

These standard overlay charts increase the range of application and the efficiency of Mitutoyo profile projectors.

This chart set offers you the following benefits:

- The charts are supplied in sizes ø250, 300, 340, 500 and 600 mm to suit the screens of Mitutoyo projectors.
- A large range of scales and profiles is provided that enables you to test workpiece features quickly and easily. You can test length, height, parallelism, angle, radius, taper, bore position, diameter, as well as all standardized thread and tooth profiles.
- All charts are made of a distortion-free special plastics compound and are provided with a protective coating.

Involute gear teeth

No.	Diameter [mm]	Price [€]
201385	250	**430,00**
201391	300	**499,00**
201397	340	**594,00**
512626	500	**933,00**
511848	600	**1167,00**

ISO Metric threads

No.	Diameter [mm]	Price [€]
201384	250	**430,00**
201390	300	**499,00**
201396	340	**594,00**
512625	500	**933,00**
511847	600	**1167,00**

Protractor chart

Angle **:** Divisions at 1° and 30' intervals at **178mm**/7" diameter increasing to **381mm**/15' intervals at **279mm**/11" diameter.

Features : Dedicated chart especially designed for checking angles with exceptional clarity. Suitable for use at any magnification.

No.	Diameter [mm]	Price [€]
201381	250	**430,00**
201387	300	**499,00**
201393	340	**594,00**
512622	500	**933,00**
511844	600	**1167,00**

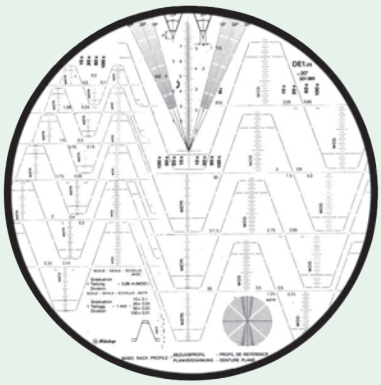
Radius chart

Features : Dedicated chart especially designed for checking radii, diameters and concentricity with exceptional clarity.

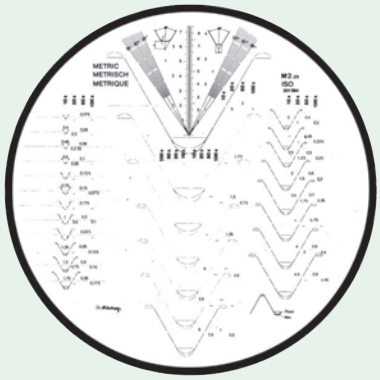
No.	Diameter [mm]	Price [€]
201382	250	**430,00**
201388	300	**499,00**
201394	340	**594,00**
512623	500	**933,00**
511845	600	**1167,00**

Additional Specifications

Grid divisions	10X : 0,1 mm 20X : 0,05 mm 50X : 0,02 mm 100X : 0,01 mm



Involute gear teeth



ISO Metric threads

Protractor chart

Radius chart

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Accessories for Measuring Projectors

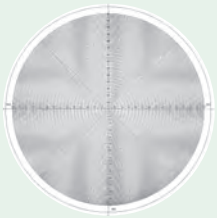
Group 2 - Makes inspection of projected images an easy process.

Optional accessories

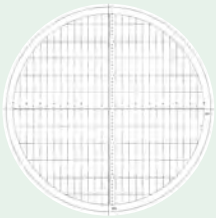
No.	Description	Price €
12AAM027	Overlay chart set (12 sheets) **(No. 12AAM587 to 12AAM598)**	855,00

12AAM587

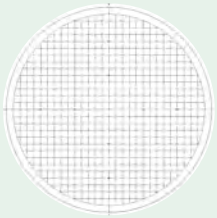
12AAM588



12AAM589

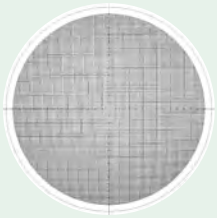


12AAM590



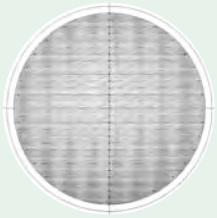
12AAM591

12AAM592

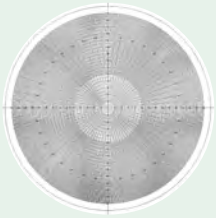


12AAM593

12AAM594



12AAM595



12AAM596

12AAM597

12AAM598

Metric

Description	ø 300 mm	
	No.	Price [€]
Concentric circles 1 mm pitch	12AAM589	78,00
Concentric circles at 1 mm pitch with radial index 1° increments	12AAM596	92,00
Crossed lines with 0,5 mm pitch	12AAM592	81,00
Crossed lines with 1 mm graduation and concentric circles 5 mm pitch	12AAM588	78,00
Grid chart (10 x 10 mm)	12AAM591	81,00
Grid chart (1 mm pitch)	12AAM593	78,00
Horizontal for 20X, vertical for 50X with 1 mm graduations	12AAM590	78,00
Horizontal lines 1 mm pitch	12AAM595	78,00
Metric threads 0,075 - 0,225 mm, 100X involute gear teeth : 20° MOD 0,2-1, 14,5° MOD 0,2-1	12AAM598	78,00
Metric threads 0,2-2 mm, unified threads 28-12 TPI 20X Whitworth threads 20-10 TPI 20X	12AAM597	81,00
Radial index 1° increments	12AAM594	78,00
Radial index 1° increments (upper) concentric circle 1 mm pitch (lower)	12AAM587	81,00

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Accessories for Measuring Projectors

Workpiece Fixtures

For Profile Projectors and Measuring Microscopes

Centre Support

No.	Max. workpiece height [mm]	Mass [kg]	Price [€]
172-142	120	3,3	**976,00**

172-142

Centre Support Riser

No.	Max. workpiece height [mm]	Mass [kg]	Price [€]
172-143	240	3,3	**509,00**

172-143

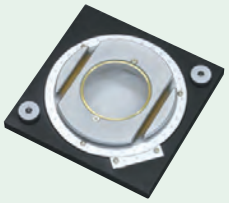
Holder with Clamp

No.	Max. workpiece height [mm]	Mass [kg]	Price [€]
176-107	35	0,42	**266,00**

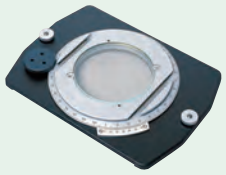
176-107

Rotary Tables

No.	Effective glass dia. [mm]	Angular resolution °	Fine feed	Mass [kg]	Price [€]
176-106	66	6		1,7	**796,00**
172-198	96	1	Available	2,4	**976,00**
172-196	100	1		2,5	**955,00**
176-305	182		Available	5,5	**1857,00**
176-306	238		Available	6,5	**2408,00**



176-106



172-198

Rotary Vice

No.	Rotary range	Width of jaws [mm]	Angle graduations °	Max. workpiece height [mm]	Mass [kg]	Price [€]
172-144	360°	40	5	60	2,8	**923,00**

172-144

Swivel Centre Support

No.	Max workpiece dia. [mm]	Swivel range	Max. workpiece length [mm]	Mass [kg]	Price [€]
176-105	70 (45) when swiveled 10°	±10°	140	2,4	**950,00**
172-197	80 (65) when swiveled 10°	±10°	140	2,5	**824,00**

172-197

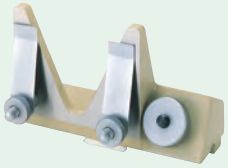
V-Block with Clamp

No.	Max workpiece dia. [mm]	Width of block [mm]	Mass [kg]	Price [€]
172-378	25	41	0,8	**313,00**
172-234	50	60	1,24	**568,00**

172-234 - 172-378

Vertical Holder

No.	Mass [kg]	Price [€]
172-132	1,3	**382,00**



172-132

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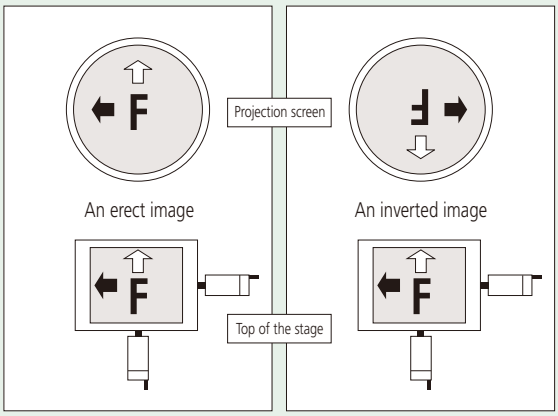
Quick Guide to Precision Measuring Instruments

Profile Projectors

Erect Image and Inverted Image

An image of an object projected onto a screen is erect if it is orientated the same way as the object on the stage. If the image is reversed top to bottom, left to right and by movement with respect to the object on the stage (as shown in the figure below) it is referred to as an inverted image (also known as a reversed image, which is probably more accurate).



F Workpiece
⬅ X-axis movement
⇦ Y-axis movement

Magnification Accuracy

The magnification accuracy of a projector when using a certain lens is established by projecting an image of a reference object and comparing the size of the image of this object, as measured on the screen, with the expected size (calculated from the lens magnification, as marked) to produce a percentage magnification accuracy figure, as illustrated below. The reference object is often in the form of a small, graduated glass scale called a `stage micrometer' or `standard scale', and the projected image of this is measured with a larger glass scale known as a `reading scale'.

(Note that magnification accuracy is not the same as measuring accuracy.)

$$\Delta M(\%) = \frac{L - \ell M}{\ell M} \times 100$$

ΔM(%): Magnification accuracy expressed as a percentage of the nominal lens magnification
L : Length of the projected image of the reference object measured on the screen
ℓ : Length of the reference object
M : Magnification of the projection lens

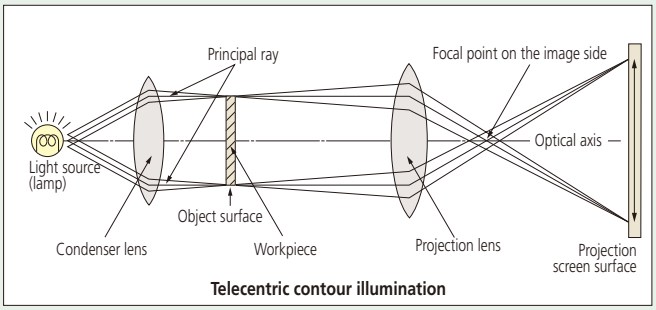
Type of Illumination

- Contour illumination: An illumination method to observe a workpiece by transmitted light and is used mainly for measuring the magnified contour image of a workpiece.
- Coaxial surface illumination: An illumination method whereby a workpiece is illuminated by light transmitted coaxially to the lens for the observation/measurement of the surface. (A half-mirror or a projection lens with a built-in half-mirror is needed.)
- Oblique surface illumination: A method of illumination by obliquely illuminating the workpiece surface. This method provides an image of enhanced contrast, allowing it to be observed three-dimensionally and clearly. However, note that an error is apt to occur in dimensional measurement with this method of illumination.
  (An oblique mirror is needed. Models in the PJ-H30 series are supplied with an oblique mirror.)

Telecentric Optical System

An optical system based on the principle that the principal ray is aligned parallel to the optical axis by placing a lens stop on the focal point on the image side. Its functional feature is that the image will not vary in size though the image blurs as the object is shifted along the optical axis.

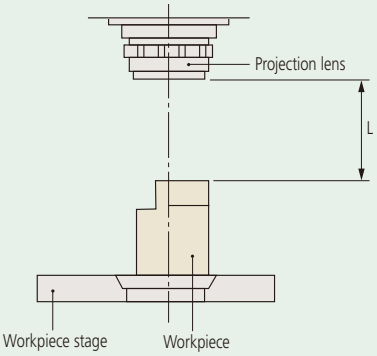
For measuring projectors and measuring microscopes, an identical effect is obtained by placing a lamp filament at the focal point of a condenser lens instead of a lens stop so that the object is illuminated with parallel beams. (See the figure below.)



Telecentric contour illumination

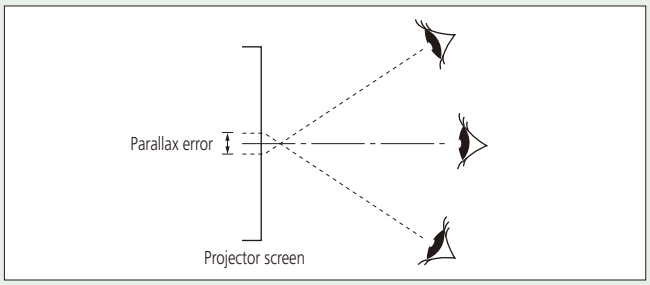
Working distance

Refers to the distance from the face of the projection lens to the surface of a workpiece in focus. It is represented by L in the diagram below.



Parallax error

This is the displacement of an object against a fixed background caused by a change in the observer's position and a finite separation of the object and background planes.



Field of view diameter

The maximum diameter of workpiece that can be projected using a particular lens.

$$\text{Field of view diameter (mm)} = \frac{\text{Screen diameter of profile projector}}{\text{Magnification of projection lens used}}$$

Example: If a 5X magnification lens is used for a projector with a screen of ø500mm:
Field of view diameter is given by $\frac{500\text{mm}}{5} = 100\text{mm}$

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Mitutoyo